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DRAWINGS ATTACHED

1 263 126

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(72) Inventor WILBUR THOMAS WAKELY

(54) A PACKAGE FOR ONE OR MORE ACTIVE OR PASSIVE CIRCUIT COMPONENTS

(71) We, TEXAS INSTRUMENTS INCORPORATED, a Corporation organized according to the laws of the State of Delaware, United States of America, of 13500 North Central Expressway, Dallas, Texas, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to packages for miniaturized electronic components, and more particularly to packages for miniaturized semiconductor components for connection into hybrid circuits.

Miniaturized integrated circuits have been heretofore developed which must be connected in a suitable package, commonly termed a header, prior to attachment into a printed circuit board or other hybrid circuit. Such headers are necessary because of the extremely small size of the miniature electronic components in relationship to the connection areas on the printed circuit board. The miniature electronic components may range from a single transistor up to more complex circuitry including a number of active and passive devices.

A number of various techniques have been heretofore developed for mounting miniaturized electronic components for connection to a printed circuit board. For example, the underside of a block of ceramic material has been machined to form a header having a plurality of pedestals or posts extending from the body, with a flat area between the posts. The posts are metallized on the ends thereof. The miniaturized electronic circuit is disposed in the flat area between the posts, and small jumper wires are bonded between the metallized post ends and terminals of the miniaturized electronic circuit. The header is then inverted and the metallized post ends are bonded to the hybrid circuit to secure the header in place and to electrically contact the miniaturized electronic circuit into the hybrid circuit. Such inverted headers hide the miniaturized electronic circuit upon connection into the hybrid circuit, thereby presenting problems in maintenance and testing of the miniaturized electronic circuits. Additionally, such inverted headers generally require expensive precision machining and metallizing.

Headers have also been heretofore devised wherein miniaturized electronic components are connected on the upper surface of an insulating header body, with a plurality of flexible metal leads connected to the electronic components and extending horizontally from the header body. The metal leads are bent and then connected to a printed circuit board. Problems sometimes arise due to the relatively high temperatures required to connect the metal leads to the hybrid circuit. The flexible leads present problems in manufacture and in subsequent handling of the header, as the leads tend to bend out of shape and sometimes break. Further, such flexible leads sometimes require the defining of holes in the printed circuit board.

Leadless headers have been heretofore developed wherein a miniaturized electronic circuit is mounted on the upper surface of a ceramic header and attached to discrete metallized layers on the upper surface of the ceramic header. Stiff wires are connected at one end to the metallized layers and are passed through the ceramic header to extend vertically for some distance from the bottom of the header. The ends of the wires are then soldered to a printed circuit board. A substantial amount of heat is required to fix such headers on the printed circuit board. Further, problems have arisen by solder flux being trapped between the exposed downwardly extending wires, thus causing shorts and maintenance problems. Additionally, such headers have generally required that the upper metallized areas are of the same

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type of metal as the vertically extending wires, thereby necessitating a compromise between desired conductive properties and the provision of good solder joints.

It is an object of the invention to provide an improved package or header for one or more circuit components.

According to one aspect of the invention there is provided a package for one or more active or passive or both circuit components comprising a body of insulating material having upper and lower generally planar surfaces, a plurality of insulating projections extending downwardly from said lower surface, and conductive surfaces disposed on said insulating surfaces for connection to said one or more active or passive or both circuit components and for connection into an electrical circuit.

According to another aspect of the invention there is provided a package for one or more active or passive or both circuit components comprising, a rectangular body of insulating material having generally flat upper and lower surfaces, a plurality of insulating pedestal members extending downwardly from said lower surface in a spaced apart configuration, metal films disposed on the ends of each of said pedestal members, discrete metallized leads disposed on said upper surface for connection to said circuit components, and conductive paths connecting said discrete metallized leads to said metal films.

For a more complete understanding of the present invention and for further objects and advantages thereof, reference is now made to the following description taken in conjunction with the accompanying drawings of which:

Figure 1 illustrates a perspective view of the upper portion of the header according to the invention;

Figure 2 illustrates a perspective view of the bottom surface of the header shown in Figure 1;

Figure 3 is a sectional view of one of the pedestals of the header of Figure 1 shown connected to a printed circuit board;

Figure 4 is a perspective view of the header shown in Figure 1 connected to a printed circuit board;

Figure 5 is a perspective view of the upper surface of another embodiment of the header according to the invention;

Figure 6 is a perspective view of the bottom of the header shown in Figure 5;

Figure 7 is a cross-sectional view of a portion of the header shown in Figure 5; and

Figure 8 is a sectional view of one of the pedestals of the header of Figure 5 when attached to a printed circuit board.

Referring to the drawings, Figures 1 and 2 illustrate one embodiment of the package, or header designated generally by the numeral 10. Header 10 comprises a rectangular body 12 constructed from an insulating material such as plastic, glass or ceramic material. The upper surface 14 of the body 12 is generally planar. As shown in Figure 2, the lower surface 16 of the body 12 includes a generally planar central portion, with a plurality of pedestal members 18 integrally extending from the edges of the lower surface 16. In this embodiment of the header, the pedestal members 18 have a square cross section and are symmetrically spaced along the sides of the body 12 in two linear rows.

The rectangular body 12 with the integral pedestal members 18 may be formed by a number of conventional techniques. For example, the body 12 may be molded using a conventional Dorst press from a conventional alumina ceramic material using conventional ceramic molding techniques. After the ceramic material has been pressed into the form of the body 12 by the Dorst press, the body 12 is fired using conventional ceramic techniques.

A plurality of discrete metallized leads 20 are defined on the upper surface 14. It will be understood that the configuration of the leads 20 will be changed for various connection requirements. The miniaturized electronic circuit 22 is disposed in the central portion of the upper surface 14, and small jumper wires 24 connect the ends of the leads 20 to the terminals of the miniaturized circuit 22. The miniaturized circuit 22 may comprise a plurality of active and passive elements, or may comprise only a single transistor or the like. The number of pedestal members 18 utilized will vary according to the number of output terminals from the miniaturized circuit 22.

Conductive strips 26 extend from the outer ends of the leads 20 down the edge portions of the rectangular body 12 to the bottoms of the pedestal members 18. The bottoms of each of the pedestal members 18 are coated with a metallized film 28. In the completed header assembly, a conductive path thus exists from each terminal of the miniaturized circuit 22 via the jumper wires 24, the leads 20 and conductive strips 26 to the conductive films 28 on the bottom of each pedestal.

The metallized areas may be applied to the header by any one of a number of conventional techniques. For example, the conventional molybdenum-manganese process for metallizing ceramic may be used. In that process finely ground molybdenum-manganese metal in a suitable liquid binder is applied to a surface exposed through a mask. The mask is then removed and the molybdenum-manganese coat is fired at high temperature to form a metal film which is strongly adherent to the surface of the cera-

mic material. Successive layers of other metals such as nickel, silver and gold may be deposited by electroplating to ultimately provide a layer of soft metal at the outer surface of the metal film 28 for ease of welding or soldering to the printed circuit board.

Alternatively, low temperature conductive paste may be applied to the body 12 in the desired configuration and then fired onto the ceramic body. This low temperature process will eliminate much of the cost of the relatively expensive molybdenum-manganese processing. In some instances it will be desirable to encapsulate the circuit 22 in a suitable material such as epoxy or other plastic to protect the circuit during subsequent handling and use.

As shown in Figures 3 and 4, after the miniaturized circuit 22 has been affixed to the upper surface of the header 10, the header 10 may be connected to a printed circuit board. Any suitable technique may be utilized to connect the header to the printed circuit board, such as solder reflow techniques with hot air guns. Alternatively, conventional ultrasonic welding techniques may be used. As seen in Figure 3, one of the advantages of the invention is that a good solder fillet 30 may be visually seen after the header has been attached.

As shown in Figure 4, the pedestal members 18 support the lower surface 16 of the header above the surface of the printed circuit board 32. This prevents flux from the soldering operation being trapped underneath the header, as the flux and other accumulated material may be easily flushed from beneath the header 10 by a flow of liquid or the like. Additionally, the pedestal members 18 provided a convenient means for properly orienting the header upon the printed circuit board prior to attachment.

Figures 5—8 illustrate another embodiment of a header constructed in accordance with the invention. The header comprises a rectangular body 40 of insulating material, with generally planar upper and lower surfaces. On the upper surface of the body 40, a plurality of discrete metallized leads 42 are deposited by any of the conventional processes previously described. The particular configuration of the leads 42 will vary according to the number and position of the terminals of the miniaturized electronic circuit mounted on the header. A miniaturized electronic circuit 44 is deposited on the center portion of the upper surface of the body 40. Jumper leads 46 are bonded between the circuit 44 and respective ones of the leads 42.

As best shown in Figure 6, a plurality of pedestal members 48 depend downwardly from the lower surface of the body 40. Pedestal members 48 are preferably integral with body 40. The cross section of each of the pedestal members 48 is circular, but it will be understood that for other applications the cross section may be rectangular or the like. The bottom ends of the pedestal members 48 may be rounded in order to provide a relatively small contact area with the printed circuit board. Metallized areas 50 are deposited on the bottom of each of the pedestal members 48 to facilitate connection of the header to the printed circuit board.

As best shown in Figure 7, conductive paths 52 extend through the body 40 and through each of the pedestal members 48 to electrically connect the leads 42 with the metallized areas 50. As shown in Figure 8, the header is connected to a printed circuit board 54 by placing the header on the board and welding, or otherwise affixing, the bottom of each pedestal members 48 to the printed circuit board. The header may advantageously be attached to the printed circuit board by solder reflow techniques utilizing hot gas guns. Alternatively, in some instances it may be desired to preheat the header by an external source and then merely press the header down on the printed circuit board. Infrared heating may also be utilized to solder the header to the printed circuit board.

In construction of the header shown in Figures 5—8, the body 40 may be pressed from ceramic with a Dorst press and then fired as previously described. Suitable holes are then drilled through the body 40 and each of the pedestal members 48. The holes are then filled with a suitable metal wire, or molten metal is flowed through the holes, to form conductive paths 52. The discrete leads 42 and the metallized areas 50 are applied by any of the previously described techniques. The metallized areas 50 are then subjected to coating procedures such as a hot tin dip in order to facilitate soldering of the header to the printed circuit board.

The present headers thus provides packages for securely attaching miniaturized circuits into hybrid circuits while positioning the miniaturized circuits for ease of testing and rework. The insulating pedestals depending from the headers enable easy attachment to printed circuit board, with the resulting joints visually exposed for inspection. The pedestal members also allow flux from the soldering techniques to be easily flushed out. The leadless nature of the present headers eliminates as many of the problems previously present with headers having flexible leads. The present headers are easily handled, inexpensively constructed and are readily adaptable for production line manufacture.

WHAT WE CLAIM IS:—

1. A package for one or more active or passive or both circuit comprising, a body of insulating material having upper and lower generally planar surfaces, a plurality of insulating projections extending downwardly from said lower surface, and conductive surfaces disposed on said insulating surfaces for connection to said one or more active or passive or both circuit components and for connection into an electrical circuit.

2. A package for one or more active or passive or both circuit components comprising, a rectangular body of insulating material having generally flat upper and lower surfaces, a plurality of insulating pedestal members extending downwardly from said lower surface in a spaced apart configuration, metal films disposed on the ends of each of said pedestal members, discrete metallized leads disposed on said upper surface for connection to said circuit components, and conductive paths connecting said discrete metallized leads to said metal films.

3. A package according to Claim 1 or 2, wherein said conductive surfaces or paths extend through holes in said body.

4. A package according to Claim 1 or 2 wherein said conductive surfaces or paths extend around the sides of said body.

5. A package according to Claim 1, wherein said insulating projections are linearly disposed along the edge portions of the lower surface of said body.

6. A package according to Claim 2, wherein the said sectional configuration of said pedestal members is generally rectangular.

7. A package according to Claim 2, wherein said metal films and said metallized leads are constructed from different metals.

8. A package of Claim 2, wherein the sectional configuration of said pedestal members is generally circular.

9. A package for one or more circuit components substantially as herein described with reference to Figures 1, 2 and 3 or Figures 5, 6 and 7 of the accompanying drawings.

ABEL & IMRAY,
Chartered Patent Agents,
Northumberland House,
303—306 High Holborn,
London, WC1V 7LH.

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1263126 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

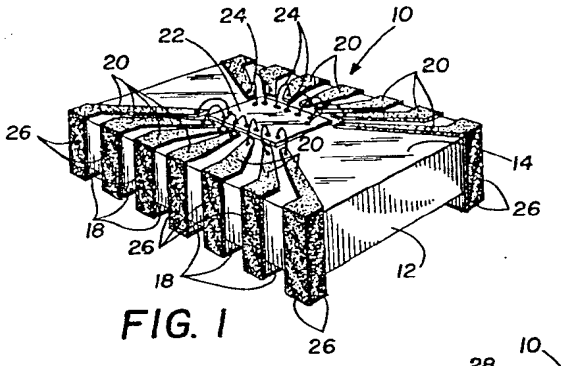

FIG. 1

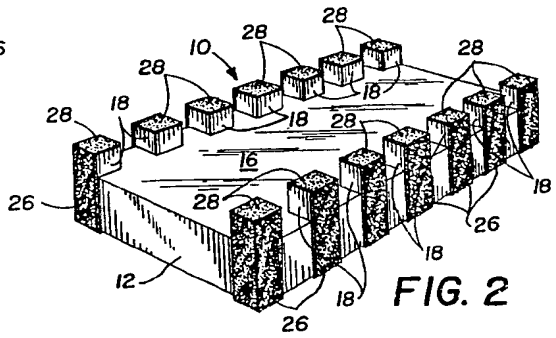

FIG. 2

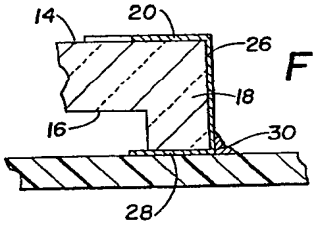

FIG. 3

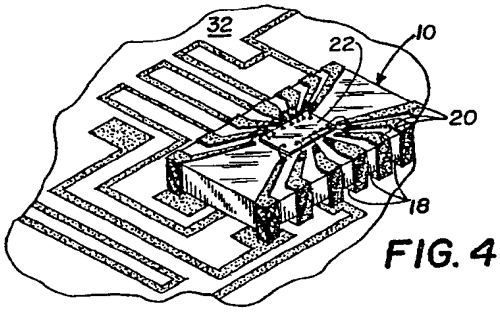

FIG. 4

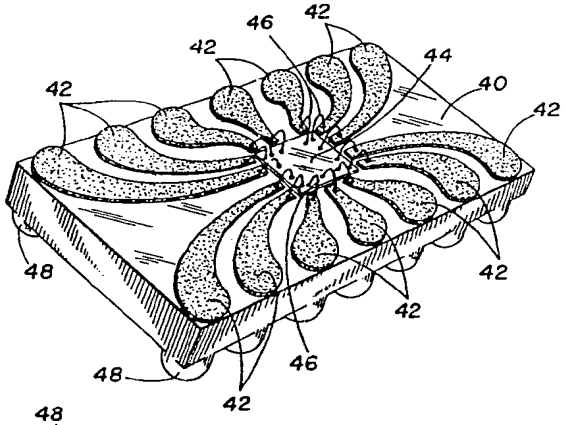

FIG. 5

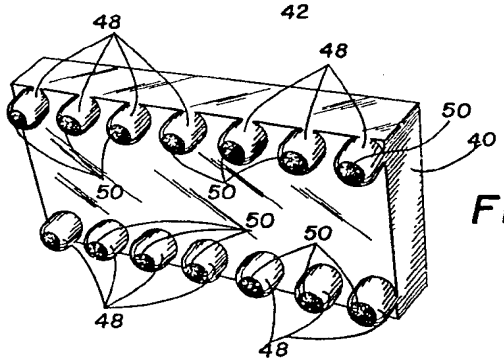

FIG. 6

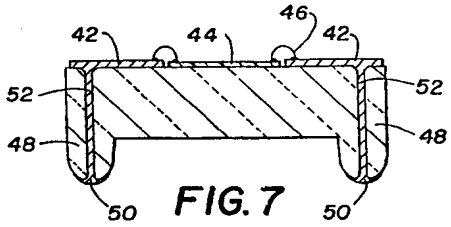

FIG. 7

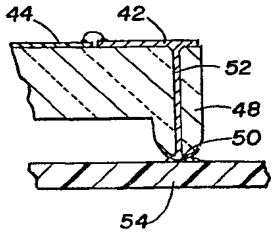

FIG. 8